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DB Name	Query	Hit Count	Set Name
USPT	l9 and l10	15	L11
USPT	geographic	11481	L10
USPT	l7 same l8	74	L9
USPT	navigation	14335	L8
USPT	communication adj network	20712	L7
USPT	l3 and l5	2	L6
USPT	ladner.in.	93	L5
USPT	l2 and l3	385	L4
USPT	device.ti.	232261	L3
USPT	lardner and location	3558	L2
USPT	lardner.inv.	12	L1

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Help | Logout | Interrupt

Main Menu | Search Form | Posting Counts | Show S Numbers | Edit S Numbers | Preferences

Search Results -

Terms	Documents
l7 and l9	7

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Search History

Today's Date: 5/24/2001

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USPT	l7 and l9	7	L10
USPT	geographic adj (information or location)	3296	L9
USPT	geographic adj information	429	L8
USPT	l3 and l5 and l6	43	L7
USPT	wireless	23712	L6
USPT	navigation	14335	L5
USPT	l2 and l3	3	L4
USPT	real adj estate	4853	L3
USPT	5032989.pn. or 5852810.pn. or 5794216.pn. or 5930699.pn. or 5938721.pn.	5	L2
USPT	5032989	47	L1

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L10: Entry 7 of 7 File: USPT Sep 24, 1996

DOCUMENT-IDENTIFIER: US 5559707 A
TITLE: Computer aided routing system

BSPR:
The CARS system works with a geographic information system or GIS managing data in relation to specific geographic coordinates. The GIS enables display of electronic maps which function as a user interface as well as a system for display of geographic data. The GIS and the mapping interface coordinate two broad types of data: (1) transportation routes or networks and nodes or waypoints subject to routing computations; and (2) POIs or loc/objects related to information about travel and locations in various media.

DEPR:
Alternative embodiments could include other input devices e.g. voice recognition system, joystick, touch-screen, scanner for printed map input, simplified keypad, etc., not represented here. FIG. 1A discloses the CARS computer aided routing system 100 implemented on a single, stand-alone, desktop style, personal computer. The software technology, which facilitates interactivity between routing and multimedia, also works on a more portable laptop or notebook computer, a handheld personal digital assistant (PDA), embedded in a travel planning appliance or an in-vehicle navigation system, as well as on mainframes of various kinds, distributed work stations, or networked systems. Alternatively, users can also operate the CARS computer aided routing system 100 from a remote interface through wireless or hard-wire links connecting with a distant computer system or a central service bureau.

DEPR:
From the digital map and routing function shown in FIG. 1A at 122, the user 103 can select one or more particular geographic locations, or points of interest (POIs), in order to view, hear or manipulate related information in the multimedia dimension of the invention. FIG. 1A shows the multimedia element of the invention as an episode in a multimedia presentation comprised of graphics or text, shown in an on screen window 120, or audio output conveyed to the user 103 via a speaker 107 or earphones 108. For example, in the multimedia window 120, the user 103 can view and selectively respond to color photographic or video images or related textual information about a specific location, or group of locations. Locations are chosen by the user working within the underlying digital map and routing dimension of invention, illustrated at 122. More specifically, FIG. 1A shows a scenario in which the user 103 has selected a particular lakeside location 124 on the underlying digital map, or in conjunction with a route or a waypoint along a route. The specific lakeside location 124 is shown as an X in a circle 124 on the simplified drawing of a typical digital map screen 122. The user 103 picked this point of interest located by a lake by means such as a mouse clicking operation at the location or placename as depicted on the digital map 122. The location can also be identified by words or symbols along a displayed route on the underlying digital map screen 122, by selection from a list of place names or from a list of types of locations, or by other routine or state of the art inputs.

DEPR:
The user's choice of a particular location prompts a multimedia presentation 120 of information related to the selected place e.g. stills or video pictures of the lake, local events, places to stay or eat, attractions and recreational opportunities, related text or audio narrative, local history, lore, even complex or extensive data on topographic, environmental, demographic, real estate or

marketing information, etc. The multimedia presentation is illustrated by the graphic image of a view of the lake, sailboat and mountains on the far shore, in the window 120, accompanied by related audio output 107 or 108. The CARS system 100 enables a user to prompt a multimedia presentation 120 on a location 124, or group of locations, selected from within a digital or electronic mapping system 122, equipped to do routing functions and displays 123.

DEPR:
FIG. 1A additionally illustrates procedures whereby users can modify waypoints, and other route parameters, from within the multimedia element of the software invention. Typically, routes or waypoints are displayed as highlighted line segments or points 123 on the digital or electronic map 122. Routes and waypoints may also take the form of map symbols and annotations, or of ordered lists of place names, travel directions, geographic coordinates or various other location identifiers, as described hereinafter. The CARS system 100 combines routing and multimedia elements by enabling the user 103, to add, delete or insert one or more particular geographic locations or points of interest. This is achieved based upon the presentation of multimedia information about those locations, as new or modified input for additional processing of the route.

DEPR:
FIG. 1A further illustrates output from the CARS system 100, a hardcopy printout 126; typically a customized or individualized travel plan in the shape of a strip map annotated with travel directions and related information. Output from the CARS system 100 is produced by combined interaction between the routing functions and user responses to the multimedia information about particular geographic locations. Thus, for one example, the hardcopy travel plan 126 exhibits attached points of interest, typically in the form of annotations connected with graphic arrows or pointers to particular geographic locations which fall within a predetermined distance from a displayed route. The user attaches such points of interest to a digital map route display from a multimedia presentation on those locations. Alternative forms of digital, audio, text, graphical, hardcopy or multimedia output from the CARS system 100 are detailed later in this disclosure.

DEPR:
FIGS. 1D, 1E and 1F illustrate assorted locating tools for finding geographic locations, recentering the electronic maps, and selecting specific places or geographic loci as input for routing or multimedia operations. Three buttons in the row at 136 prompt the dialog boxes for "Locate Place Name" at 137, "Locate Zip Code" in FIG. 1E and "Locate Area Code and Exchange" in FIG. 1F. This suite of locating tools facilitates searching lists by the names of places or cities and respective states or provinces as well as locating specified places by recentering the map display upon the identified location.

DEPR:
The CARS system works with one or more geographic information systems (GIS) 201 for storage, retrieval, manipulation, mapping, correlation and computation of spatial data related to geographic coordinates corresponding to locations on, above or beneath the surface of the earth within the realm of human activity. The David M. DeLorme U.S. Pat. Nos. 4,972,319 and 5,030,117, exemplify such geographic information systems for generating the map displays and output, as well as management of the geographic databases. Other GIS, or other database systems which relate data with geographic coordinates e.g. latitude and longitude, also suffice for use with the present invention.

DEPR:
Based on user optimized route computations, step 259 next expedites one or more computer displays, graphics, hardcopy, text, audio or other output, representing the initial route as computed along the waypoints input by the user. Such routes are represented as various forms of itinerary including: (1) annotated maps upon which the optimal routes are graphically marked, accentuated or highlighted; (2) lists of waypoints, or place names or geographic coordinates typically arranged in the order encountered along the route; (3) point to point directions how to take the optimal computed route indicating turning points, landmarks, navigation aids, signposts etc. along the computed route also typically arranged in temporal order of travel; (4) various combinations of the three forms of route output or itinerary just listed.

DEPR:
As disclosed in detail hereafter, various input/output transfers and combined routing/multimedia operational sequences take place through the interaction bus 237. Within the middle block 207, the interaction bus 237 facilitates repetitive, looped or iterative operations as well as user interactions producing combined output at step 265 by sequencing multimedia and routing operations. For example, the system 200 enables users to blend pure routing output generated at 259 with subsequent multimedia operations by transferring data via path 261, the interaction bus 237, and path 241 to the multimedia input step 243. In this manner, users can prompt a multimedia experience of information focused upon places found along the way i.e. within a preset distance of, or in a user defined region around, an initial route or set of waypoints. Thus in typical operations, the invention 200 sequences prior routing and subsequent multimedia operations to generate route based multimedia information presentations on locations or points of interest along an initial route. Output 259 from prior route computations gets transferred from block 205, the routing subsystem, through the interaction bus 237, over into the multimedia subsystem 209 which then absorbs the route data as multimedia input at step 243. The user can then pick and play one or more multimedia presentations about points of interest or geographic locations found in the vicinity of the current optimal route highlighted on the map display.

DEPR:
The invention 200 also provides for selectivity, flexibility and iteration in composing operational sequences so that the user can engage in extended integrated series of operations to develop and refine a single personalized travel plan. Such unique custom or individualized travel plans typically culminate from sequences of pure or combined multimedia or routing operations. The system 200 is interactive i.e. enabling the user to control operational content, sequencing, parameters and media. This disclosure uses the term "interactivity" to describe how the system 200 provides for flexible ongoing user control over the order or sequencing of operations, and the exercise of optional commands and parameters, shown generally at 211, 215 and 219. User options are described further relative to FIGS. 1B-1M and I-O to 1P which picture the user interface for one embodiment. Command and parameter options that influence multimedia or routing format, content or sequencing are also disclosed in relation to FIGS. 3, 4, 7, 8A-8E. For one example, the user can calibrate or adjust the module for routing calculations, at 245 in FIG. 2, to get the quickest or shortest travel route, or other preferred or optimal parameters for routing computations, as detailed relative to FIG. 4. For another example, paths 233, 235, 261, 263, 267, 241, 251 and 269 comprise optional pathways for the transfer of location data and travel information in various media between the routing 205 and the multimedia subsystems. Selecting among these pathways, the user controls sequencing, combination and iteration of multimedia and/or routing, as detailed hereafter. Also, alternative options to start and stop operations shown at 203, 204, 275, 277 and 279 facilitate user control over operational arrangements as well as input and output formats. Moreover, the user exercises flexible controls over the medium, topical focus and substantive content of the geographic information or travel presentations which are generated in the multimedia subsystem 209 in FIG. 2, described hereafter in more detail relative to FIGS. 8A-8E.

DEPR:
In the lexicon of this disclosure, attaching multimedia refers to the process of picking, transferring and displaying multimedia about particular POIs or locations through the interaction block 207 for inclusion upon travel plan output at 265 with reference to FIG. 2. Attached multimedia can comprise text annotations about POIs with graphic arrows or pointers indicating the site or geographic location of specific POIs on travel plans in the form of map hardcopy or map display output on which one or more routes are highlighted, as shown in FIG. 1N. Other embodiments enable attachment of still or moving images, sound, and various other media to travel plan output. Though such multimedia attachments invariably modify the informational content of travel plans, the definitive feature of travel plans with attached multimedia is that the highlighted computed optimal routing component has not been altered by modification of the waypoint lists.

DEPR:
In the simplified embodiment of the CARS system the user can choose to browse one or more of the following lists: (1) Points of Interest i.e. tourist or cultural

attractions; (2) Hotels; (2) Campgrounds; and (3) Restaurants. Alternative embodiments incorporate a broader range of well-known techniques for storage, retrieval and correlation of geographic or cartographic data. For example, customer and sales prospect information can be stored in a relational database linking geographic locations with various personal, business and financial data. Such a database would be useful for diverse sales, service, delivery, property survey and security functions, particularly to prepare travel or route plans with multimedia digital photos of valued prospects or real estate. Utilizing such a relational customer database, sales force personnel can evaluate and locate prospects and established accounts needing a sales call, then extract the pertinent street addresses as waypoint input in order to prompt computation of an efficient, comprehensive route for making a round of sales calls.

DEPR:
Similarly, service and delivery personnel can plan their work for the day or the week on the road. Appropriate databases can help identify prime properties or security trouble spots. Real estate or security agents can input the street addresses or other location identifiers from the database in order to compose a waypoint list as input for the computation of an optimal route encompassing the properties of interest to the agents. With the waypoint list at step 411 and the background map display, alternate embodiments of the invention incorporate a variety of well-known databasing methodologies in order to enable the user to design, implement, output and further process diverse searches for waypoint input. In like fashion, waypoint lists can be memorized and recalled for later use or modification.

DEPR:
Other embodiments of the system provide further parameters or options for optimal routing computations. Scenic routes can be identified in the database of highways, roads and other modes of transport such that a minor routine modification of the overall routing algorithm program then enables the user to prefer roads and transport which afford natural vistas and ample opportunities for sightseeing. Similarly, enhancements to the route database can address highway width, clearance and load factors such that the routing algorithm, with minor alterations, can output travel plans suited to the specialized requirements of truckers and heavy transport. Using programming techniques well known in the field of geographic information systems and digital cartography for managing located statistical data expressed in the form of map overlays, routing computations can be integrated with databases relating geographic locations with a broad range of situated conditions. Thus, users of the present invention can choose an optimal route computation which prefers or avoids high crime areas, particular environmental or weather conditions, residential versus industrial or rural as opposed to urban areas, even geocoded demographic or economic factors, provided the embodiment is linked to the appropriate databases.

DEPR:
The present invention facilitates other forms and methods to attach information about locations. For example, to enhance a hardcopy travel plan for making sales calls on the road, step 459 facilitates attaching digital photos of sales prospects beside marginal notes detailing their name, personal interests and past purchasing history. This located information aids the user not only to find sales prospects' locations but also to recognize the prospects' faces, remember names and create a more effective and personable impression. Similar attached photographic imagery proves useful with various travel plans: (1) photos of landmarks as navigation aids; (2) digital pictures of drop-off sites, loading docks and other shipping terminal facilities to aid truckers and other delivery personnel; (3) images of industrial facilities, homes, buildings and land as seen from the road to enhance travel plans for real estate surveys, private security, public safety, etc.; and (4) attached digital photos enhance scenic or sightseeing travel plans. FIG. 1N illustrates attached digital photos of people and property. Attached images of faces, places or other located content are not limited to still digital photo imagery except in hardcopy output. The system enables attachment of videos, extensive alphanumerical text or voice information about places or POIs, or situated music or natural sounds to map/route displays.

DEPR:
More specifically, 501 in the upper left of FIG. 5 shows a simplified map display. Such map displays appear on the computer screen serving as a graphic interface in practically all modes of operation and various embodiments of the

present invention. The map display in 501 is centered upon a location named PLACE, for purposes of this illustration, situated in between SOUTH PLACE and NORTH PLACE, representing municipalities or parts thereof. As is routine in conventional map making and digital cartography, these entities are represented on maps by their names written on the map with the place name situated on the map in relation to its actual geographic location. Sometimes, place name labels on maps are visually associated with a located symbol, such as a dot or political subdivision boundaries or colored area on the map. No such graphic symbols are associated with the underlined place names in the 501 illustration, however, in the interest of a simpler drawing. Generally, place names comprise a particular cartographic data type. In the underlying geographic information system or database, specific geographic coordinates are linked to each place name. Storage, retrieval, manipulation and linkage of place names are done by means of well known list based, spatial, relational, and other database methodologies which are routinely used for management of geographic point types of data.

DEPR:
For various alternate embodiments, in order to address marine, air flights, off-road, pedestrian or other forms of transport and travel, waypoints are structured according to the physical and mappable characteristics of those other ways of going places. For example, travel by air involves available airports, private planes and commercial lines, safe and customary flight paths, terrain obstacles, etc., which become factors or building blocks for appropriate air waypoint data structures. Travel on foot is also constrained by legal and safety issues exemplified by sidewalks and crosswalks as well as issues of customary paths or trails and natural terrain limitations plus artificial obstacles, etc. Subways, buses and other public ground transportation systems and public or private marine travel also require waypoint data structures appropriate to the mode of transportation, taking into account factors such as available stops, stations, terminals or docks, regular routes, connections and schedules, human or natural obstacles, safe navigation practices, etc. Ordinary cars and railroad travel are plainly confined to certain routes and tracks. Travel by air, foot and boat takes place in a more open spatial context still constrained, however, by customary or legal paths or channels and physical obstacles. In the FIG. 5 map display at 501, waypoints 510, 512 and 514 are structured as nodes coinciding with various intersections of ordinary automobile roads and highways.

DEPR:
Such grid systems may comprise more than just a visual user aid. The present invention is typically, though not necessarily, implemented in conjunction with a geographic information system, or GIS, which manages spatial data with reference to interrelated matrices of quadrangular grids or tiles constructed substantially parallel to lines of latitude or longitude. Map database systems of this kind are detailed and disclosed, for example, in the David M. DeLorme U.S. Pat. Nos. 4,972,319 and 5,030,117 also, in the now pending U.S. patent application Ser. No. 08/265,327 David M. DeLorme and Keith Gray inventors, titled COMPUTER AIDED MAP LOCATION SYSTEM.

DEPR:
Map database systems or GIS organizing geographic data in terms of tiles, quads, grids or frames present several advantages disclosed in the background art just cited. These advantages generally derive from breaking down the massive amounts of data typically involved in a state of the art GIS into discrete, identifiable, adjacent and related map tiles, quads, grids and frames to store, retrieve, manipulate and integrate geographic information. Rapid generation or redrawing of map displays, recentering or panning across seamless maps, zooming to closer or more outlying map scales, as well as the correlation of located data and the management of cartographic computations are all enhanced by such GIS which manage masses of geographic data in small quadrangular units.

DEPR:
FIGS. 6A and 6B search for POIs utilizing data structures depicted in FIG. 5 particularly the circle methodology sketched in FIG. 5A at 526. As depicted at 201 in the FIG. 2 block diagram, the present invention preferably works in relation to a geographic information system (GIS) or a mapping database system which manages massive amounts of cartographic or located information through use of tiles, quads, frames or grids. The grids comprise quadrangular units of geographic data stored, retrieved and processed relative to particular geographic coordinates. At step 612, a circle of radius R is drawn around the current node

as a first step. Step 325 in FIG. 3, connector N and step 467 in FIG. 4 show procedures whereby the user adjusts or resizes the radius R. The parameter 563 in FIG. 5B indicates an analogous, adjustable parameter or criteria, namely the line buffer tangent T, which is also variable at the user's option in order to modify the size of the user defined region searched for POIs. Next, in step 612 in FIG. 6A, all tiles touched by the circle are identified and listed in 614 for further processing in FIG. 6B. Step 616 does the housekeeping chore of setting up for further sessions of tile gathering around subsequent nodes.

DEPR:
This flexibility and selectivity within the multimedia mode facilitates and enhances two major groupings of user interactions with the inventive technology, combining multimedia and routing. The first relates to user responses to the multimedia, choosing or deleting places or waypoints for ensuing routing operations. The second group relates to responses to the multimedia wherein the user picks, composes, edits or removes information related to geographic locations in various media and formats which then is attached to travel plan output. These responses are implemented through steps 309 and 315 in FIG. 3, which transfer both data and operations from the multimedia mode to the routing mode. In turn, these responses are combined with routing through pathway 403 and step 465 in FIG. 4. Relative to FIGS. 3 and 4, more details are furnished elsewhere in this specification on how user interactivity with located multimedia gets combined with routing computations and travel plan output by waypoint input list modification or the attachment process.

DEPR:
Alternate embodiments of the present invention additionally facilitate editing and amendment of text attachments, attachment of selected visual images or audio output, and the insertion or input of new or supplemental multimedia located information through obvious, routine state of the art programming techniques for storage, retrieval and modification of multimedia data. For example, as detailed in relation to FIG. 4 and illustrated in FIG. 1N, embodiments for sales, real estate or security agents attach digital photo images, or even video clips, of particular properties or people at the appropriate locations on specialized travel plan outputs. Available technology further permits attachment of audio messages to travel plan output at relevant locations. Emergency or delivery personnel can recall and hear crucial client messages or instructions in relation to the known or estimated location of an emergency or delivery event. Relative to specific geographic locations, personal snapshots or video, voice/audio experiences recorded on tape or text recollections can be input, stored and recalled, utilizing the present invention as a digital travel album. Such diverse contents and media can be modified, revised and composed selectively together employing obvious, state of the art techniques for the computerized manipulation of interrelated text, graphic imagery or audio data.